# MINERvA Test Beam 2 Status

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for the Test Beam 2 Team
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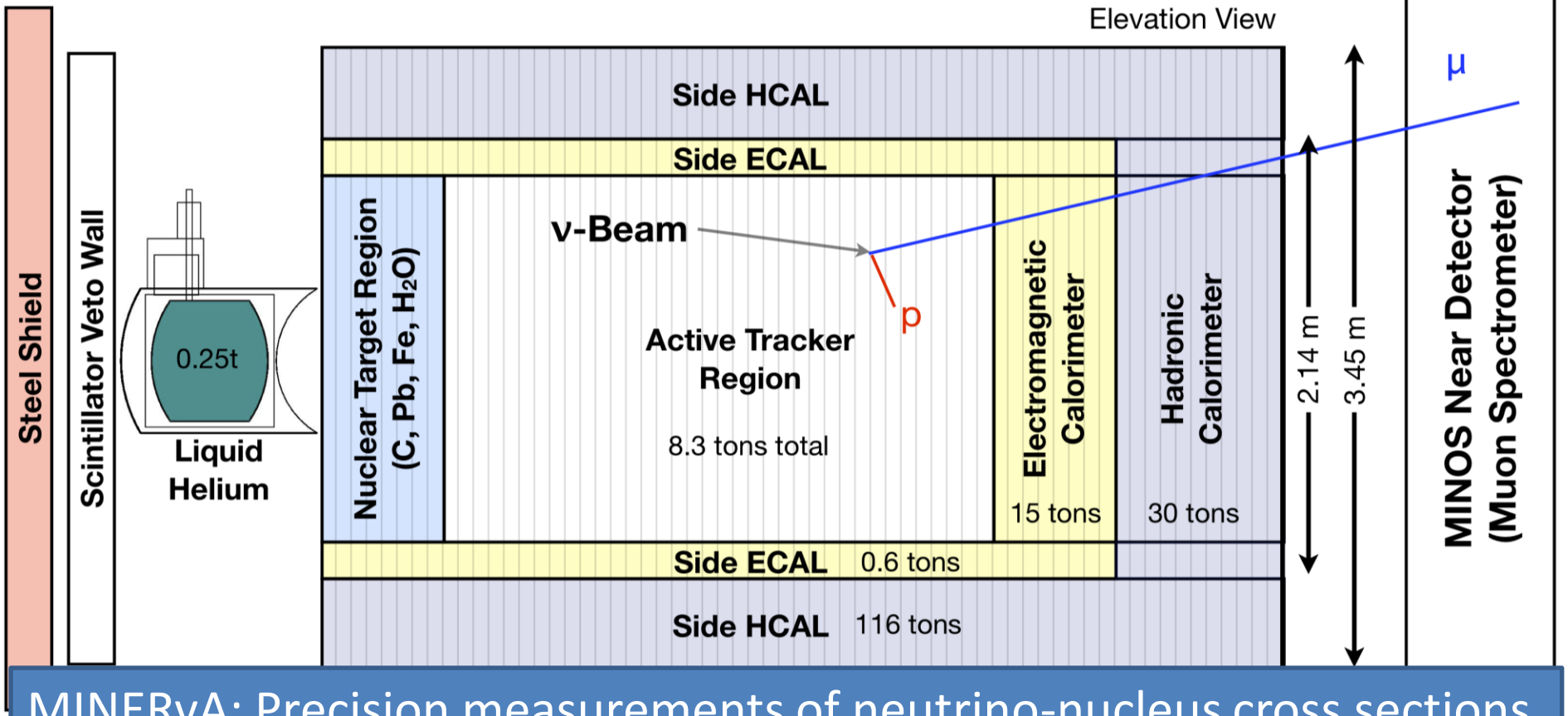
# MINERvA Detector

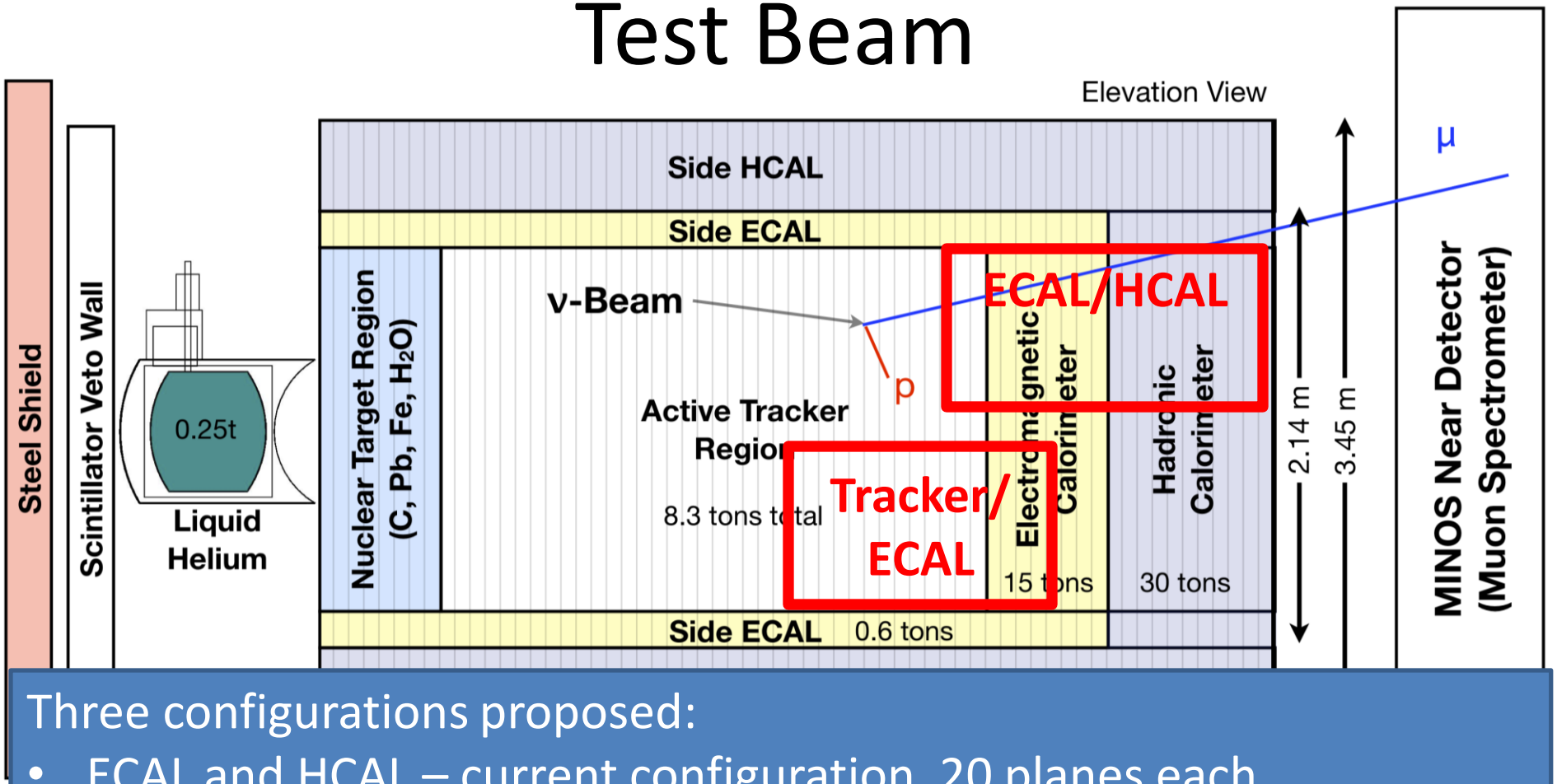



MINERvA: Precision measurements of neutrino-nucleus cross sections

- Detector: Measure properties of particles exiting the nucleus
- Particles: Protons, neutrons, pions, muons, electrons, …

Test beam goal: Measure how well the Monte Carlo (MC) simulation of the detector response of these particles describe the data.

# Test Beam




Three configurations proposed:

- ECAL and HCAL – current configuration, 20 planes each
- HCAL heavy – steel planes in place of lead planes, 40 planes
- Tracker and ECAL

Test beam 1 – energies up to 2 GeV, positive and negative particles

Test beam 2 – energies up to 8 GeV (or more), pos and neg particles

# Test Beam Systems

- MINERvA detector
  - Mini version
- Time of Flight
  - Identify protons
- Veto system
  - Two particles
- Cosmic panels
  - Physical orientation
- Trigger board
  - Trigger particle arrival time
- Cherenkov (FTBF)
  - Identify electrons
- Tracking (FTBF)
  - Two particles
- DAQs
  - Minerva
  - CAMAC
  - Wire chamber
- Trigger System
- Monitoring
  - Minerva
  - CAMAC
  - Wire chamber
  - Event display (Arachne)

# Schedule

| | | | | | | |
|---|---|---|---|---|---|---|
| Feb 6 - Feb 10 | T977 | MINERvA | primary | 24 | 2D | Bellantoni |
| Feb 11 - Feb 17 | T977 | MINERvA | | | D | Bellantoni |
| Feb 18 - Feb 24 | T977 | MINERvA | | | D | Bellantoni |
| Feb 25 - Mar 3 | T977 | MINERvA | primary | 24 | 2D | Bellantoni |
| Mar 4 - Mar 8 | T977 | MINERvA | primary | 24 | 2D | Bellantoni |
| Mar 9 - Mar 17 | T1041 | CMS Forward | | | | |
| Mar 18 - Mar 23 | T1041 | CMS Forward | | | | |
| Mar 23 - Mar 29 | T1065 | Secondary Er | | | B | Ronzhin |
| Mar 30 - Apr 7 | T977 | MINERvA | | | D | Bellantoni |
| Apr 8 - Apr 14 | T977 | MINERvA | | | D | Bellantoni |
| Apr 15 - Apr 21 | T977 | MINERvA | | | D | Bellantoni |
| Apr 22 - Apr 28 | T979 | Fast Timing w/Cherenkov Counters | Primary | 0800 - 2000 | 2-B | Albrow |
| Apr 29 - May 5 | | | | | | |

Run Manager appointed Feb 4
30 days of commissioning

Squeezed in studies, Collaboration meeting

Week off?, Start with AEM talk

Take production data!
21 days

Other data taking opportunities?

# Commissioning (1/3)

- Get all systems into shape
- Take data runs at most energies
  - Started on 2/25
  - 100 hours of data
  - Positive and negative particles
    - Trigger system vetos electron events
  - Only electrons
- All systems included in read out
- Organization - Dee Hahn, shift schedule

# Commissioning (2/3)

- MINERvA detector
  - Mini version
- Time of Flight
  - Identify protons
- Veto system
  - Two particles
- Cosmic panels
  - Physical orientation
- Trigger board
  - Trigger particle arrival time
- Cherenkov (FTBF)
  - Identify electrons
- Tracking (FTBF)
  - Two particles

- DAQs
  - Minerva
  - CAMAC
  - Wire chamber
- Trigger System
- Monitoring
  - Minerva
  - CAMAC
  - Wire chamber
  - Event display (Arachne)

Improve every system
Validate every system with data
Looking at data now

# Commissioning (3/3)

- Event display (Arachne)
  - Overnight cosmic ray running provides internal calibration data
- Accelerator
  - Tuning for low energy beams
    - Michael Backfish, Operators
  - MCenter coming on line
- FTBF
  - Helium tubes (Todd Nebel)
  - Wire chambers (Ewa Skup)
- Verify updated readout firmware
  - Record more hits in the detector
  - Needed for medium energy running
  - Install during summer 2015 shutdown

# Squeezed in Studies

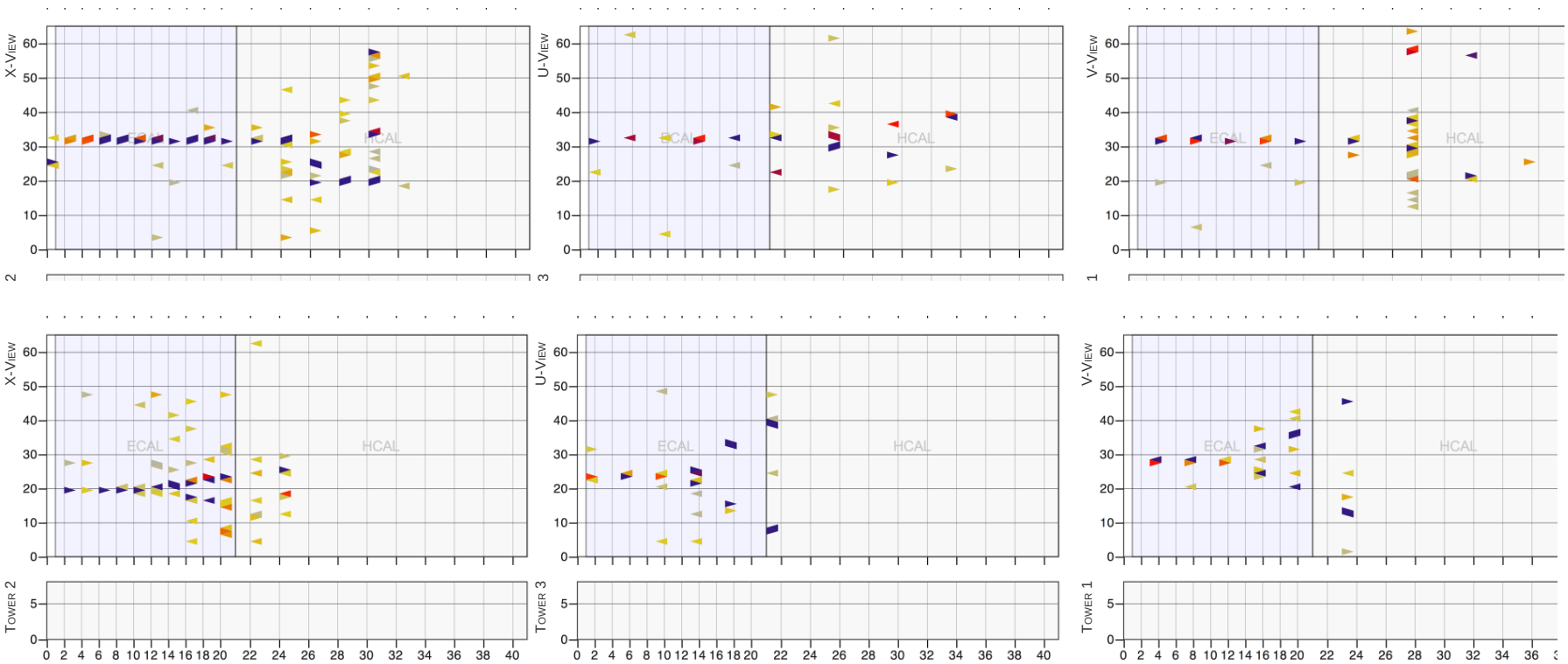
- Both phases of T1041 finished early
- Beam characterization studies using electrons with Pb-Glass calorimeter
- Cherenkov efficiency studies with Pb-Glass calorimeter
- Reduce electrons with eighth inch lead sheet
  - Installed 3/19
  - Main contaminant at low energies
  - Reduce run time?
- Reduce the amount of time needed for these studies in the next running period

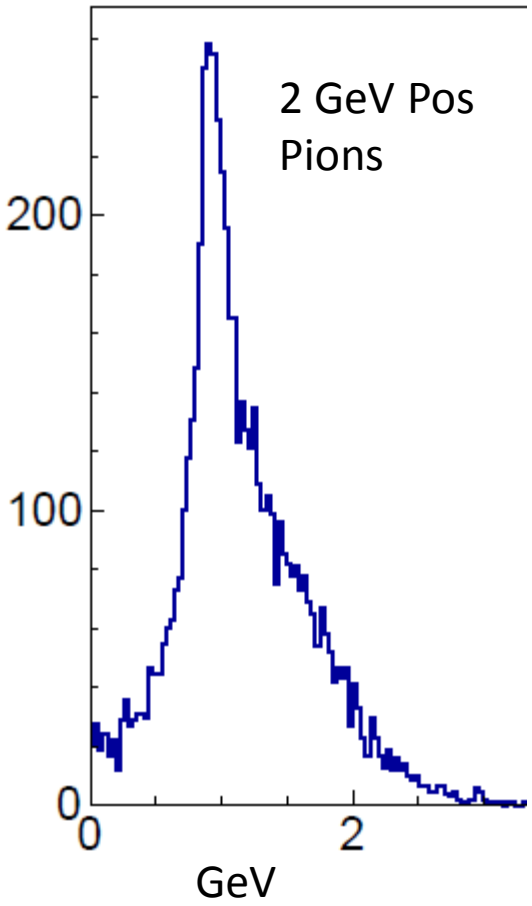
# Run Plan

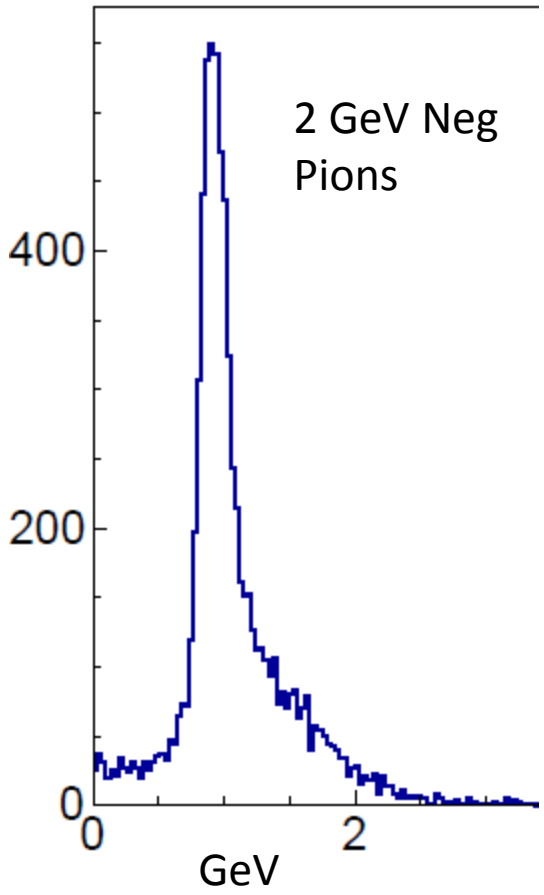
- How many events are enough?
  - Don’t want to change configurations and then go back
- Commissioning data being examined in Arachne
  - Team of dedicated event scanners
  - Verify operation of systems from event lists provided by experts
  - Count the number of “good” events
- We have preliminary run plan estimates showing we need about 4 weeks of steady data taking for ECAL/HCAL
  - Range of energies 1.55 to 8 GeV
  - Positive and negative

# 2GeV Pion Candidates

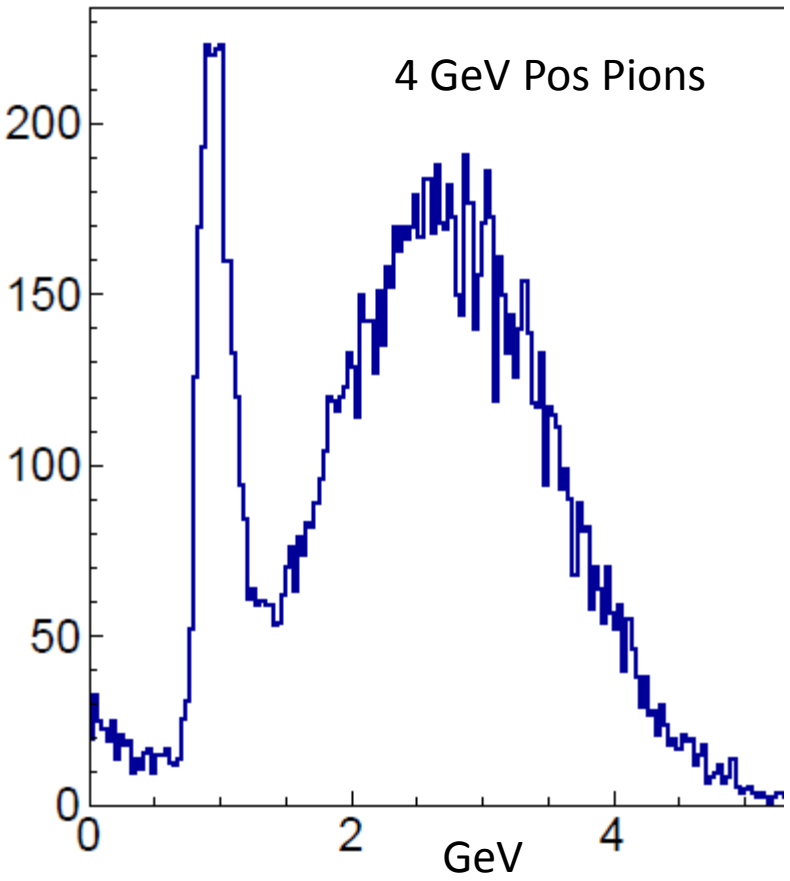
- Seeing many different ways pions interact

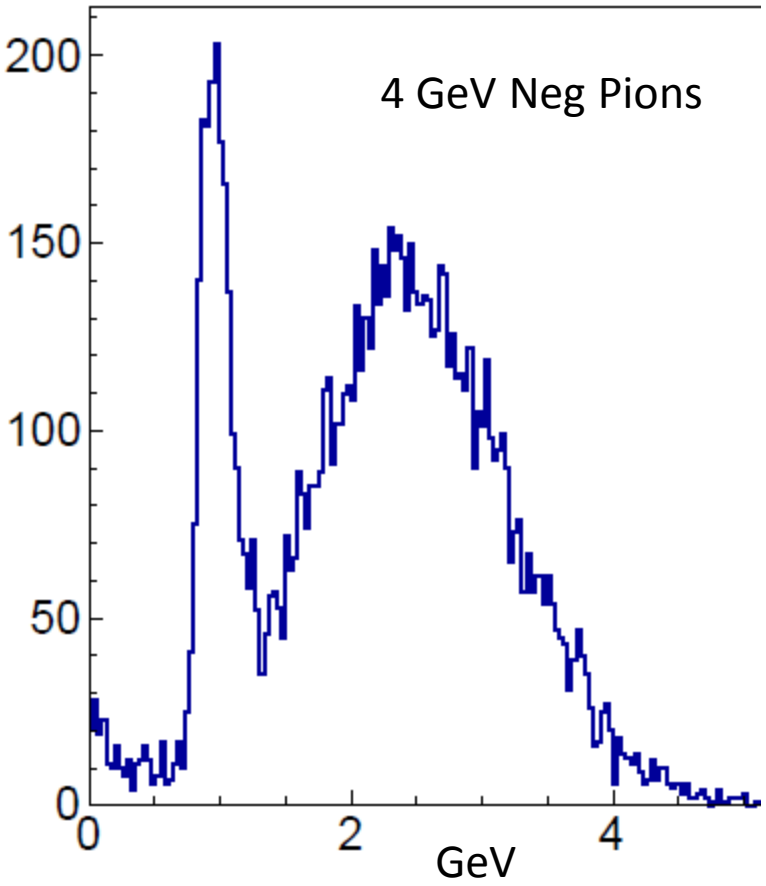





Energy deposited in the detector for incident 2 GeV pions.
Muon peak at 1 GeV.
Similar to MINERvA test beam 1.
Crude energy calibration (10%) of 6.3 photo electrons per MeV.

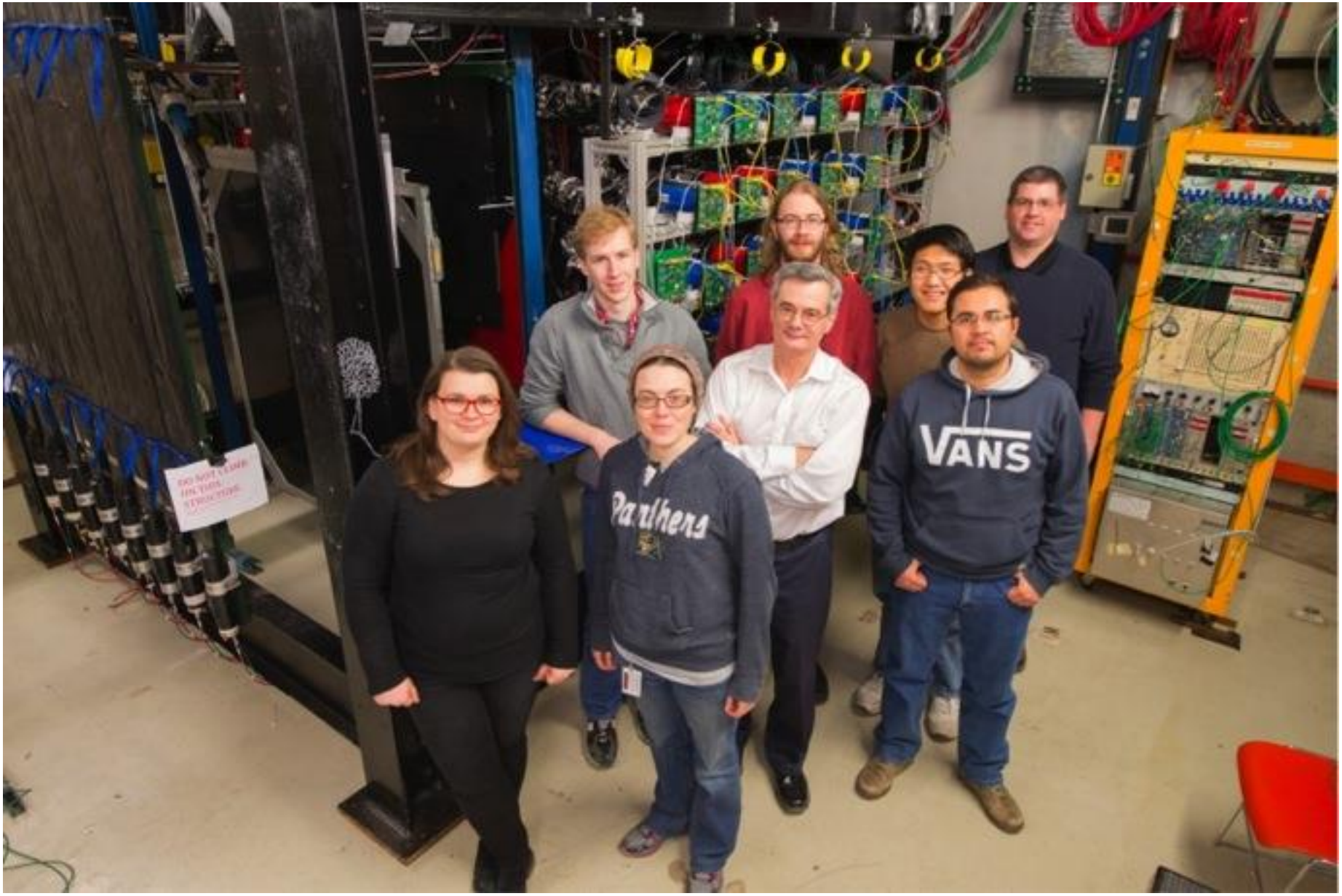



Energy deposited in the detector for incident 4 GeV pions.
Muon peak at 1 GeV.
Crude energy calibration (10%) of 6.3 photo electrons per MeV.
Looks reasonable.

# Summary

- Commissioning time was successful
  - Systems improved and developed
  - Collected data for event scanning
- Used time efficiently between T1041 runs
  - Studies
  - Electron reduction with lead sheet
- Accelerator becoming more proficient with running MCenter and MTest simultaneously
- Adding finishing touches this week
- Ready for data next week
- Be prepared for other opportunities this year


VANS

# NuMI Beam Performance Plots